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RMRS Rocky Mountain Remediation Services L.L.C
protecting the environment

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REV 0

FINAL
SAMPLING AND ANALYSIS PLAN TO SUPPORT THE SOURCE REMOVAL AT THE MOUND SITE
IHSS 113

• Operations •
Rocky Flats Environmental Technology Site

FEBRUARY 18, 1997

RF/RMRS-96-0060

FINAL
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TO SUPPORT THE SOURCE REMOVAL AT
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IHSS 113

Rocky Mountain Remediation Services, L.L.C

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ACRONYMS

ADM	Administrative Procedures Manual
APO	Analytical Projects Office
ASTM	American Society for Testing Materials
CCR	Colorado Code of Regulations
CLP	Contract Laboratory Program
COC	Chain of Custody
CRZ	Contamination Reduction Zone
CSFS	Contaminated Soil Feed Stockpile
CWTF	Consolidated Water Treatment Facility
EPA	Environmental Protection Agency
EMD	Environmental Management Department
FID	Flame Ionization Detector
FIP	Field Implementation Plan
FIDLER	Field Instrument for the Detection of Low Energy Radiation
FO	Field Operations (Manual)
HCl	Hydrochloric Acid
HPGe	High Purity Germanium
HNO_3	Nitric Acid
H_2SO_4	Sulfuric Acid
IHSS	Individual Hazardous Substance Site
LDR(s)	Land Disposal Restrictions
LLW	Low-level Waste
NaOH	Sodium Hydroxide
OU	Operable Unit
OVA	Organic Vapor Analyzer
PAM	Proposed Action Memorandum
PARCC	Precision, Accuracy, Representativeness, Completeness, and Comparability
PCE	Tetrachloroethene
PPM	Parts Per Million
QA	Quality Assurance
QC	Quality Control
RCRA	Resource Conservation and Recovery Act
REP	Radiological Engineering Procedure
RFCA	Rocky Flats Cleanup Agreement
RFEDS	Rocky Flats Environmental Database System

(continued next page)

Acronyms Continued

RFETS	Rocky Flats Environmental Technology Site
ROI	Radiological Operating Instruction
SAP	Sampling and Analysis Plan
SOPs	Standard Operating Procedures
SOW	Statement of Work
TCE	Trichloroethene
TCLP	Toxicity Characteristic Leaching Procedure
TDS	Total Dissolved Solids
TDU	Thermal Desorption Unit
TSS	Total Suspended Solids
VOA	Volatile Organic Analysis
VOCs	Volatile Organic Compounds
WAC	Waste Acceptance Criteria
yd^3	Cubic Yard

LIST OF STANDARD OPERATING PROCEDURES (SOPs)

IDENTIFICATION NUMBER.	PROCEDURE TITLE.
5-21000-OPS-FO 03	*General Equipment Decontamination*
5-21000-OPS-FO 13	*Containerization Preserving Handling and Shipping of Soil and Water Samples*
4-B29-ER-OPS-FO 14	*Field Data Management*
2-G32-ER-ADM-08 02	*Evaluation of ERM Data for Usability in Final Reports*
ROI 6 6	*Operation of the Bicron FIDLER*
REP 14 01	*Operation of the Nomad Portable Gamma Spectroscopy System*
4-S23-ROI-03 02	*Radiological Requirements for Unrestricted Release*
4-Q97-REP-1003	*Radiological Evaluation for Unrestricted Release of Property/Waste*

1 0 INTRODUCTION

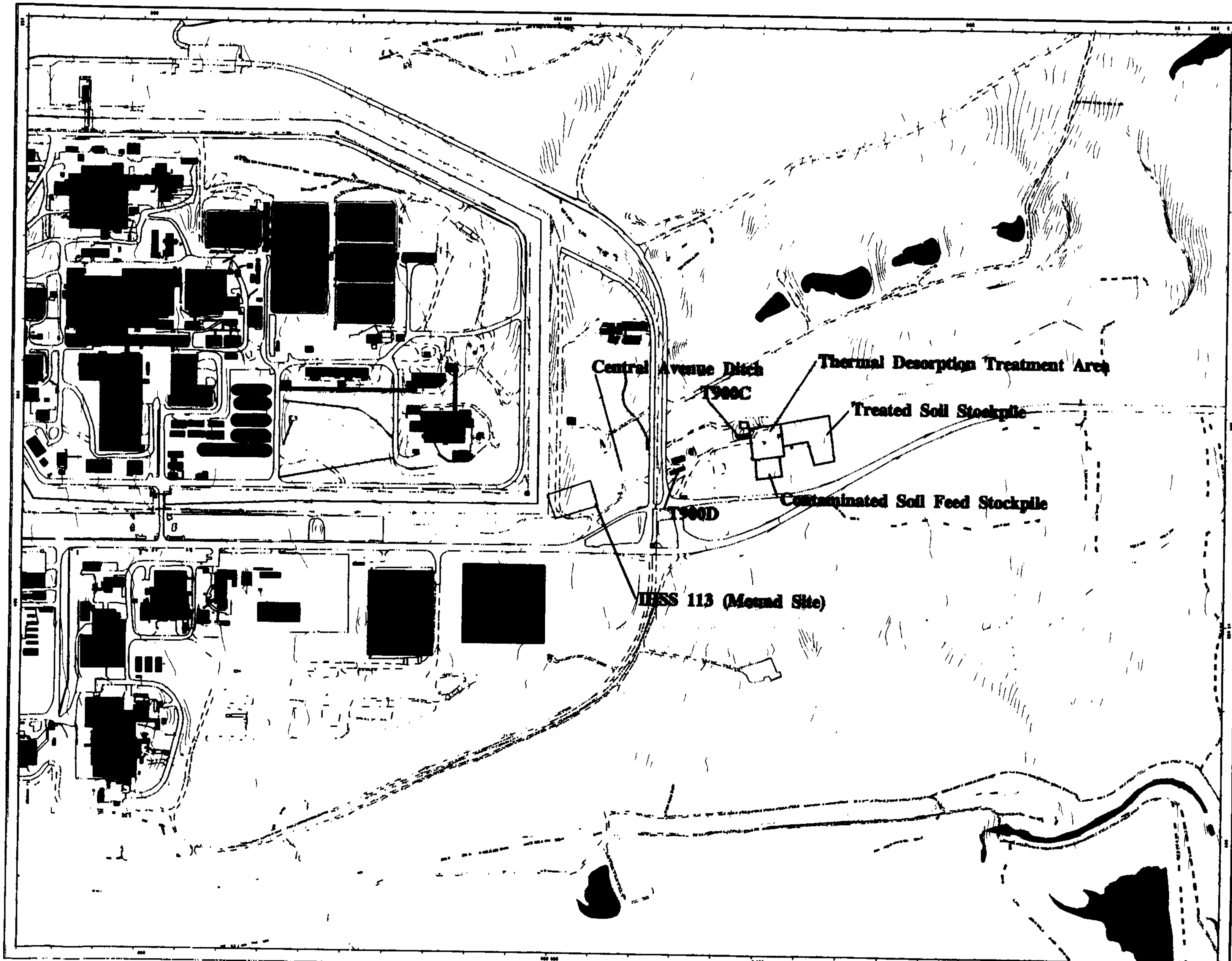
This Sampling and Analysis Plan (SAP) supports the Source Removal at the Mound Site, Individual Hazardous Substance Site (IHSS) 113, at the Rocky Flats Environmental Technology Site (RFETS) This source removal project is described in the Proposed Action Memorandum (PAM) for the Source Removal at the Mound Site (RMRS, 1997) This SAP is intended to provide concise information necessary to provide guidance for collecting samples required for the project Sampling activities will be conducted in accordance with the RMRS Quality Assurance Program Plan (RMRS, 1995)

The Mound Site is located north of Central Avenue, and east of the Protected Area fence (Figure 1-1) Approximately 1,405 intact drums were placed at the Mound Site between April 1954 and September 1958 and covered with soil, thus generating a "mound" The drums originated from Buildings 444, 883, 771, and 776, and contained uranium, beryllium, hydraulic oil, carbon tetrachloride and tetrachloroethene (PCE) Records also indicate that some of the drums contained low levels of plutonium.

Information on site history, chemical and radiological contamination, geology, and hydrogeology of the Mound Site have been collected over many years and documented in various reports including the *Rocky Flats Environmental Technology Site Historical Release Report for the Rocky Flats Plant* (DOE, 1992), the *Phase II RFI/RI Report for Operable Unit No 2* (DOE, 1995), the *Soil Vapor Survey Report for Operable Unit 2 Subsurface Interim Remedial Action* (EG&G, 1994), the *Draft Trenches and Mound Site Characterization Report* (RMRS, 1996a), and from *Results of the 1996 Pre-Remedial Investigation of the Mound Site* (RMRS, 1996b)

In 1970, the drums were removed from the Mound Site along with radiologically contaminated soil Approximately 10 percent of the drums were thought to have holes at the time of removal Solid material was shipped off-site for disposal, while liquids were sent to Building 774 for processing No airborne radiological contamination was detected during the drum removal Soil from the excavation was graded and the excess was placed in the landfill Records do not indicate the volume of contaminants released to the soils at the Mound Site

Recent characterization data indicates volatile organic compounds (VOCs), predominantly PCE, in subsurface soils at levels requiring cleanup It is estimated that 400 to 1,000 cubic yards (yd^3)



Mound Site Location Map

Figure 1 1

EXPLANATION

Contours (5 intervals)

IHSS

Standard Map Features

Buildings or other structures

Lakes and ponds

Streams, ditches, or other drainage features

Fences

Paved roads

Dirt roads

State Plane Coordinate Projection
Colorado Central Zone

U S Department of Energy
Rocky Flats Environmental Technology Site

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of soil are contaminated with VOCs (RMRS, 1996b) above the Tier I Subsurface Soil Action Levels specified in the Rocky Flats Cleanup Agreement (RFCA) (DOE, 1996)

Under this proposed action, the contaminated soils above action levels for VOCs will be excavated from the Mound Site and processed using low temperature thermal desorption technology to remove the VOC contaminants of concern At the conclusion of the project, the treated soil will be returned to the Mound Site excavation and the area will be revegetated

The RFCA Tier I Subsurface Soil Action Levels were used for determining the extent of excavation and are used as cleanup target levels in Section 3 2 1 of the PAM The performance or treatment goals for the thermal desorption unit (TDU) have been established at levels that meet or are below the Resource Conservation and Recovery Act (RCRA) Treatment Standards for Hazardous Waste (6 Colorado Code of Regulations (CCR) 1007-3, 268 40) for the VOCs found in the Mound Site soils The TDU performance goals are listed in Section 3 2 3 of the PAM

2 0 SAMPLING AND DATA QUALITY OBJECTIVES

Data needs to support the objectives of this project were developed using criteria established in *Guidance for the Data Quality Objective Process*, EPA QA/G-4 (EPA, 1994) The data gaps, study boundaries, and decisions, etc , are described in Chapters 2 and 3 of this plan

This sampling effort will serve several purposes as described below

- To evaluate/verify that cleanup target levels stated in Table 3-1 of the PAM are met soil samples will be collected at the excavation boundary These samples will also be used to document the conditions remaining at the excavation boundary for a future RFETS Site-wide risk assessment and to supply data for evaluating any future impacts on groundwater

- Samples will be collected to evaluate return of radiologically contaminated soils if radioactivity above set threshold levels is detected during field screening activities (see Section 3 1 2 of this document)

- Samples will be collected of treated soil to evaluate/verify that TDU performance goals stated in the Table 3-2 of the PAM are met These samples will also be used to document the concentration of VOCs in soil returned to the Mound Site after processing

- Samples will be collected from the soil below the contaminated soil feed stockpile (CSFS) to evaluate/verify that residual VOC contamination has been removed.

- Samples will be collected of condensate recovered from the TDU system to support on-site treatment

- Samples will be collected to support various waste classifications for off-site shipment of treatment residuals

After excavation, soil samples will be collected along the base and sides of the excavation and analyzed according to the U S Environmental Protection Agency's (EPA) SW-846 Method 8260A for total VOCs The analytical detection limit will be at least 0 6 ppm - 1 25 ppm (e g , below all excavation/treatment requirements) Excavation boundary samples are considered "critical samples" for completeness calculations Excavation will continue until excavation boundary sample results are below the cleanup target levels specified in Table 3-1 of the PAM or until the excavation constraints specified in Section 3.2 1 of the PAM are met. These constraints state that the excavation will be limited to the highly weathered bedrock below the alluvial/bedrock contact This highly weathered bedrock is expected to be approximately two to three feet below the top of bedrock.

Following processing through the TDU, treated soils will be sampled and analyzed for VOC content to verify compliance with the TDU performance goals stated in Table 3-2 of the PAM The sampling frequency used for this verification is described in Section 3.2, and the statistical analysis supporting the sampling frequency is given in Appendix 1 of this plan These samples are also considered "critical samples" for completeness calculations Characterization data has been evaluated and indicates that metals, semivolatile organics and radionuclides are not contaminants of concern at the Mound Site Therefore, no further analyses will be performed for these parameters, other than for waste characterization purposes. However, as described in Section 3 1 2 of this plan, if unexpected levels of radionuclides are found during radiological screening, samples will be collected for radioisotopic identification.

The cleanup target levels specified for excavation perimeter sampling will be used to guide the cleanup of residual VOC contamination beneath the CSFS, and any incidental spill areas generated during this project

The data quality objective for residual waste generated as part of this project will be to collect data that meets the waste acceptance criteria (WAC) of the appropriate treatment, storage or disposal facilities Residual wastes will include high efficiency particulate air (HEPA) filters, and condensate recovered from the TDU process Aqueous phase condensate will be treated at the Consolidated Water Treatment Facility (CWTF) located in Building 891 The analyses specified in Section 3 3 1 are required by CWTF personnel to assist in the effective treatment of the condensate Final disposition of other residual wastes will depend on the characterization results

3 0 SAMPLE COLLECTION AND ANALYSIS

The sampling requirements for each type of sample event to be performed under this SAP is described in the following sections If conditions are encountered in the field which make the use of a procedure unsafe or inappropriate for the task at hand, the specified procedures may be modified or replaced as long as the modification or replacement procedure is justified and detailed in the field logbook, and the resulting data is comparable and adequate to meet the objectives of the project

3 1 EXCAVATION BOUNDARY SAMPLING

The intent of this section is to provide a process for evaluating if the VOC target cleanup levels specified in the PAM have been attained In addition, this section provides a process for performing radiological screens on excavated soil for protection of the workers, the public and the environment

3 1 1 Evaluation of Cleanup Target Levels

Samples will be collected at the excavation boundaries to evaluate if the VOC cleanup target levels specified in Table 3-1 of the PAM have been met The excavation boundaries are expected to be approximately 20' x 30' x 12 - 15 deep A systematic grid to locate any remaining VOC contamination will be used To determine the number of samples required and grid spacing, a statistical evaluation was performed in accordance with *Statistical Methods for Environmental Pollution Monitoring* (Gilbert, 1987) A sampling grid of approximately 10' x 10' will provide a 90% confidence that a circular target of contaminated soil 15' in diameter will be detected This grid pattern requires the collection of 12 samples from a 20' x 30' excavation bottom (Figure 3-1)

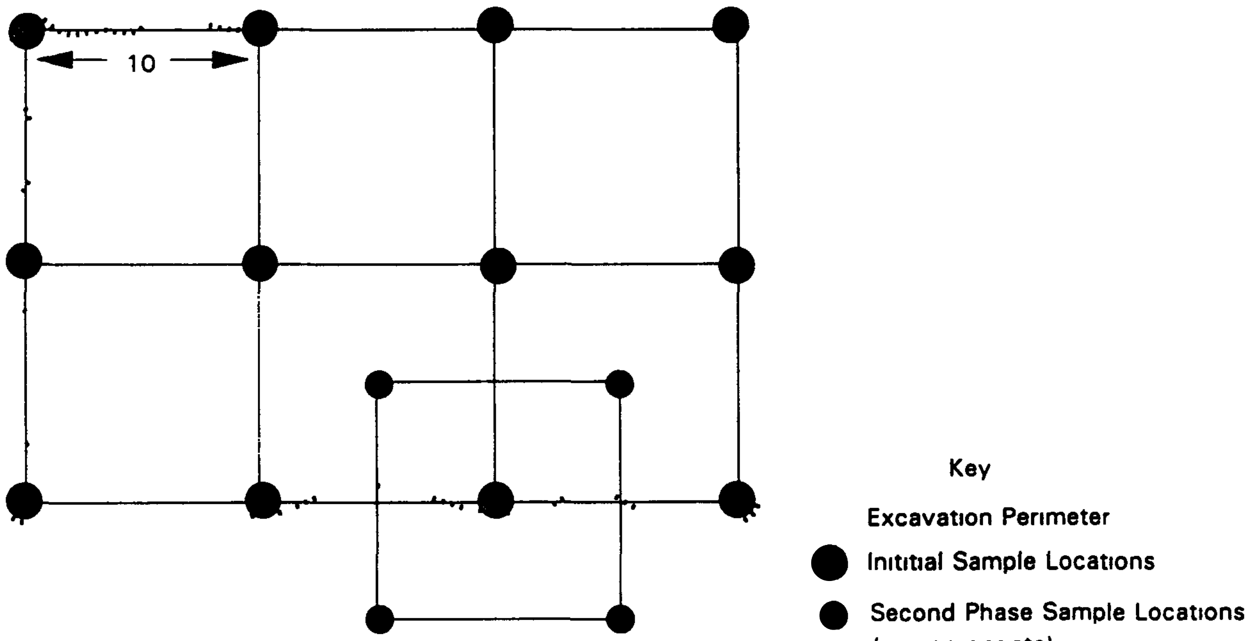
Field screening with an organic vapor analyzer (OVA) will be conducted to guide excavation activities Initial screening will be conducted by placing the OVA probe near the soil in the excavator bucket, and monitoring the soil vapor Screening samples may be collected to identify lower levels of VOC contamination This will be done by filling a sample container with soil, closing it, and subsequently warming the container to at least 60° F, as appropriate The lid of the container will then be opened, and the soil will be immediately monitored with the OVA If little or no VOCs are detected, this may indicate that VOC contaminated soil has been removed in this area, and the confirmatory sampling described below can proceed. The use of the OVA and screening samples will only provide a qualitative assessment

If the OVA monitoring results indicate that VOCs have been removed, confirmation samples will be collected from the excavation bottom and sidewalls in accordance with Table 3-1 Approximately 12 samples will be collected at the excavation bottom, as depicted by Figure 3-1 VOC contamination will be assessed on the excavation sidewalls by collecting an additional 10 samples, approximately 2' above the bedrock/alluvial contact, adjacent to the samples collected on the excavation bottom

If samples exceed the cleanup target levels specified in the PAM, and the limiting conditions for total depth specified in the PAM have not been met, additional excavation and sampling will be required The area surrounding "failed" sampling locations will be excavated, including sidewalls, as necessary Following this excavation, samples will be collected at the center and corners of a 10' x 10' grid centered over the initial "failed" sample location (Figure 3-1), as appropriate

Table 3-1 shows the number and types of regular and quality control samples expected for the Mound Site excavation These samples will be used to document the undisturbed boundaries of the excavation and to evaluate attainment of the cleanup target levels

FIGURE 3-1 MOUND SITE EXCAVATION BOTTOM SAMPLING LOCATIONS



Because of the hazards associated with entry into steep-sided, unsupported excavations, field personnel will not enter the excavation Each sample will be collected from the excavation by means of the excavator bucket or similar equipment The excavated soil contained in the excavator bucket will be elevated from inside the excavation to the ground surface Grab samples will be collected directly from the excavator bucket using new disposable sampling spoons, or decontaminated stainless steel spoons The excavator bucket will be decontaminated prior to the sampling event, but will not be decontaminated between individual sampling grids To mitigate cross contamination, samples will be collected from soil that is not directly in contact with the bucket

TABLE 3-1 EXCAVATION BOUNDARY SAMPLES

Analysis Method	Excavation Samples	QC Samples	Total Samples	Container Preservation Holding Time
Total VOAs by SW846-8260A	22+	1 field duplicate/20 regular samples	24+ (more collected if excavation proceeds)	4 oz. glass with Teflon liner at 4°C for 14 days
Rinsates Blanks by SW846-8260A	(if reusable sampling equipment is used)	1/20 regular samples	2+	2-40 ml glass vials, Teflon-lined septa lid HCl pH<2 4°C for 14 days
Trip Blanks by SW846-8260A (supplied by laboratory)		1/cooler for off-site VOC samples	1+	2-40 ml glass vials Teflon-lined septa lid, HCl pH<2 4°C for 14 days
Radiological Screen to support off-site shipping requirements		1 per off-site shipment (if required by radiological engineering)	1+	40 ml glass vial 6 months Note substitute a 250 ml wide-mouth plastic jar when using a Nomad portable gamma spectroscopy system
Radioisotopic or HPGe			0-10	250 ml wide-mouth plastic jar

3 1 2 Radiological Verification of Soils Returned to the Excavation

Radiological screening will be performed to protect the workers, the public and the environment from potential radiological hazards associated with excavated Mound Site soils This section establishes a process for segregation of soils and subsequent quantitative isotopic analysis if the radiological threshold, defined below, is exceeded during field screening Quantitative isotopic results will be used to evaluate if segregated soil meets the radiological action level criteria established in the RFCA and stated in the PAM for this project. Section 2.3 2 of the PAM presents the evaluation of the existing radiological data for the site From this evaluation, it is expected that the soil excavated during this project will be returned to the site after treatment This section focuses on a real-time radiological field screening approach to identify contamination in the excavated soils

During excavation of the Mound Site, the soil will be screened with a Field Instrument for the Detection of Low Energy Radiation (FIDLER) Generally, screening will be conducted from the exposed surface of each excavator bucket of soil removed from the excavation (approximately 2 yd^3) The rate of screening will be continuously evaluated by radiological controls personnel and may be reduced if radioactivity is not detected above the levels described below This reduction may be reduced to not less than individual dump truck loads

However, screening detail will be increased if visual characteristics indicative of contamination such as discovery of debris, visible staining or free product stringers are encountered

FIDLER monitoring will be performed in accordance with Radiological Operating Instruction (ROI) - 6 6, Operation of the Bicron FIDLER Soil will be segregated when the FIDLER exhibits readings greater than three times ambient background, which correlates to approximately 6600 counts on the instrument This FIDLER screening value was obtained using empirical data from previous environmental restoration activities These activities showed that below this screening level, there is little potential of exceeding RFCA radiological Tier II Subsurface Soil Action Levels However, there is no direct correlation between the FIDLER response and the RFCA action levels

Soils having FIDLER readings less than three times background (6600 counts) will not be segregated and will not require additional characterization Soil having radionuclide content greater than three time background will be segregated and will require isotopic characterization Sampling frequency will depend upon the volume of soil segregated with readings equal to, or greater than 6600 counts Generally, samples will be collected to represent no more than a single dumptruck volume (20 yd^3) of soil If only small volumes of radiologically contaminated soils are encountered, samples will be collected to represent the smaller volume (e g , 2 - 5 yd^3) encountered Samples will be collected as unbiased composites from the segregated material The samples will be made by compositing five individual subsamples, collected systematically around the segregated soil pile

Samples of radiologically segregated material may either be analyzed by a radiochemistry laboratory for isotopic uranium, plutonium and americium or may be analyzed on-site, using a gamma spectroscopy analysis The use of gamma spectroscopy analysis will provide isotopic characterization using a high purity germanium (HPGe) gamma spectroscopy system per Radiological Engineering Procedure 14 01, *Operation of the Nomad Portable Gamma Spectroscopy System* This system can provide rapid, quantitative analyses of the radioisotopes, and will provide data of sufficient quality and detection levels to evaluate against radiological action levels described in the RFCA Based on analytical results, treated soil exceeding a total sum of ratio of 1 0 (based on the 95% upper confidence limit of the mean) for radionuclides will not be dispositioned without concurrence from the agencies

3 2 PROCESS VERIFICATION SOIL SAMPLING

The TDU system is expected to be a batch process system The batch process system is anticipated to consist of 4 ovens configured in parallel with the pollution control system Unprocessed soil is loaded into two trays which are then loaded into each oven The trays have capacities of 2 25 yd^3 each (4 5 yd^3) per oven load Samples will be collected from the travs after processing to document attainment of TDU performance goals stated in Table 3-2 of the PAM In the event that another TDU is selected in the procurement process a document modification request will be prepared to account for modifications to the sampling process, if required

3 2 1 Sampling Frequency to Establish Baseline Conditions

To establish baseline conditions, process verification samples for VOCs will be collected at a greater frequency in the initial (baselining) phase of the project. At the beginning of treatment, one process verification sample will be collected from every oven load of processed soil This will continue until two successive loads from each oven meet the TDU performance goals stated in the PAM, and the main operating parameters (residence time at a terminal soil bed temperature) have been established, and are relatively constant The operating parameters established during the baselining will not be reduced during the rest of the project Soils containing the highest levels of VOCs will be stockpiled in a location that can be accessible for treatment during initial baselining

When the mean and variance processed soil concentrations indicate a 95% probability of attaining the TDU performance goals, the system will be judged to be in control and samples will then be collected at the reduced frequency established in the following subsection, and justified in Appendix 1 This determination will be made after the analytical results and operating logs are evaluated by the project quality assurance officer and project manager Table 3-2 lists the sample types and frequency to establish the baseline. The samples used to establish baseline conditions will be collected using the same approach used for collection of samples after baseline conditions have been established, which is detailed in the following subsection

TABLE 3-2 SOIL SAMPLING FOR BASELINE ESTABLISHMENT

Analysis Method	Process Verification Samples	QC Samples	Container, Preservation, Holding Time
Total VOAs by SW846-8260A	1 per oven	1 field duplicate/20 regular samples	4 oz. glass with Teflon liner at 4°C for 14 days
Rinsates Blanks by SW846-8260A		1/20 regular samples	2-40 ml glass vials, Teflon-lined septa lid, HCl pH<2, 4°C for 14 days
Trip Blanks by SW846-8260A		1/cooler for off-site VOC samples	2-40 ml glass vials Teflon-lined septa lid HCl pH<2, 4°C for 14 days
Radiological Screen to support off-site sample shipping requirements		1 per off-site shipment (if required by radiological engineering)	40 ml glass vial 6 months Note substitute a 250 ml wide-mouth plastic jar when using a Nomad portable gamma spectroscopy system
Total Expected Number of samples	12 regular samples	1 field duplicate 1 rinsate 2 trip blanks 2 rad screens	

3 2 2 Sampling Frequency After Baseline Conditions are Established

Following the establishment of baseline conditions, samples will be collected at a reduced frequency An evaluation of the confidence level associated with the sampling frequency is given in Appendix 1 This frequency is expected to consist of one representative grab sample per batch (27 yd^3), contrasted to one sample per oven load as required by the initial baselining process A batch is defined as the material from six sequential loads of an individual oven, and was defined to meet the statistical sampling methodology (Appendix 1) Each oven will contain approximately 4 5 yd^3 of soil Therefore, a batch will be approximately 27 yd^3 The number and types of samples are described in Table 3-3

During successive batch processing runs, the trays and locations within the trays being sampled will be alternated, so that all areas of the ovens are sampled These samples will be collected as uncomposited grab samples, with a decontaminated sampling spoon or similar device The sampling position within the oven will be systematic and representative, in that successive samples will be collected from a corner, from a side, and from the center of the trays All sample locations within the ovens/trays will be noted in the field logbook Detrimental anomalies in process controls, feed stock composition, and waste type may require additional sampling to determine any effects that the anomalies may have on VOC concentrations in the treated soil If sampling results indicate that the TDU performance goals stated in Table 3-2 of the PAM have not been achieved, then the soil represented by that sample (e g , the batch) will be retreated and subsequently resampled

TABLE 3-3 PROCESS VERIFICATION SOIL SAMPLING

Analysis Method	Process Verification Samples	QC Samples	Container, Preservation, Holding Time
Total VOAs by SW846 8260A	1 per batch	1 field duplicate/20 regular samples	4 oz glass with Teflon liner at 4°C for 14 days
Rinsates Blanks by SW846 8260A		1/20 regular samples	2-40 ml glass vials Teflon lined septa lid HCl pH<2 4°C for 14 days
Trip Blanks by SW846 8260A		1/cooler for off site VOC samples	2 40 ml glass vials Teflon lined septa lid HCl pH<2 4°C for 14 days
Radiological Screen to support off site sample shipping requirements		1 per off site shipment (if required by radiological engineering)	40 ml glass vial 6 months Note substitute a 250 ml wide mouth plastic jar when using a Nomad portable gamma spectroscopy system
Total Expected Number of samples	40 regular samples	2 field duplicates 2 rinsates 7 trip blanks 2 rad screens	

3 3 SECONDARY WASTE SAMPLING

Secondary wastestreams generated during this project will be characterized to support waste packaging, storage, and disposal requirements The majority of the secondary wastes generated during this project will include

- aqueous-phase condensate
- spent HEPA and high efficiency air filters (HEAF)
- Used PPE
- miscellaneous plastic tarps, liners

If other wastestreams or disposal options are identified, the project manager, along with the sample and waste managers will determine any additional analytical requirements These will be documented in the project logbook.

3.3 1 Aqueous Phase Condensate Sampling

Aqueous-phase condensate will be sampled prior to treatment at the on-site CWTF to support proper processing Samples may be collected using the most convenient method available such as with a bailer, peristaltic pump or similar device If a bailer is used, a bottom decanting control device may be used to fill the VOA sample vials. Other sample material may be composited in a larger container as the material is withdrawn from the condensate tanks, before placement into appropriate sample containers The actual sampling method will be described in the field logbook

Samples are expected to be collected from the 10,000 gallon condensate storage tanks located near the TDU, rather than collecting samples from the condenser itself. Samples collected from the tanks represent a more homogenous wastestream than samples collected directly from the TDU condenser Table 3-4 lists the analytical requirements to support the on-site treatment of aqueous phase condensate at the CWTF The sampling frequency will depend on the amount of condensate generated and the levels of contaminants found in the condensate During the project, between one and five sets of samples are expected to be collected. The actual number of samples will be determined by the project manager and CWTF personnel Quality control (QC) samples (e g , trip blanks) are not required by CWTF personnel for this activity

TABLE 3-4 AQUEOUS PHASE CONDENSATE SAMPLING

ANALYTE	METHOD(S)	BOTTLES	HOLDING TIME	COMMENT
Volatile Organic Compounds + Tentatively Identified Compounds	8260A	3 40 ml glass vials HCl to pH <2 4 C	14 days	
Semivolatile Organic Compounds + Tentatively Identified Compounds	8270B	3 1 L amber glass 4 C	7 days until extraction 40 days after extraction	
PCBs	8080	1 1 L amber glass 4 C	7 days until extraction 40 days after extraction	
Total Target Analyte List (TAL) Metals	6010 and 7000 series methods	1 1 L poly HNO_3 to pH<2 4 C	6 months except mercury 28 days	CLP TAL detection limits required
Total Cyanide	335 series methods or 9010A/ 9012	1 1 L poly NaOH to pH >12 4 C	14 days	Detection limit of 0 005 mg/L required
Total Organic Carbon Nitrate + Nitrite	415 series methods or 9060 353 series methods	1 1 L poly H_2SO_4 to pH <2 4 C	28 days	
Water Quality Parameters including TSS & TDS Chloride Fluoride Sulfate	 160 series methods 340 325 375 and 300 0 series methods or 9250/9030 series	1 1 L poly 4 C	 7 days 28 days	
Ignitability/flashpoint	ASTM Standard D 93 79 or D 93 80 or D 3278 78 or SW 846 1010	8 oz glass, 4 C	28 days	
Rad Screen (Gross alpha & beta)	Gas Proportional Counting	1 125 ml poly HNO_3 to pH <2	N/A	
Radiochemistry Plutonium Americium and Uranium, isotopic	Alpha Spectrometry	2 4 L poly HNO_3 to pH <2	6 months	

3 3 2 Spent HEPA/HEAF Sampling

Spent HEPA and HEAF filters are expected to be slightly radioactive and contain trace levels of VOCs after use in the TDU system Under the RCRA derived-from rule 6 CCR 1007-3, 261 3(c)(2)(i), the spent filters will be considered hazardous remediation waste Though hazardous, these filters are expected to meet the RCRA land disposal restriction (LDR) requirements, therefore, they should not require treatment prior to disposal. The filters are expected to be disposed as LDR-compliant low level-mixed waste at the Envirocare of Utah, Inc , facility in Clive, Utah The filters will have to meet the WAC contained in the facilities Customer Information Manual (Envirocare, 1996) The WAC requires that all chemical analysis be conducted at a Utah Department of Health, Division of Laboratory Services, certified laboratory (Note this is not required for geotechnical or radiochemical analyses) Table 3-5 lists the analytical parameters necessary to evaluate the filters with respect to the WAC Samples from HEAF/HEPAs are expected to be collected by cutting "coupons" from the filters using conventional scissor type cutters These coupons will be placed directly in the appropriate sample containers described in the following table.

To meet the timely disposition requirements of this project, worst-case samples will be collected of the HEAF/HEPA filters prior to completion of the treatment phase of the project. Because of different filtration characteristics, one sample will be collected from the "worst case" HEAF and one sample will be collected from the "worst case" HEPA filter. Three factors should insure the collection of worst case samples These are

1) The most contaminated soil (soil from near the surface of the Mound Site excavation) will be treated first (filters in place during this treatment will be sampled),

2) The samples will be collected from filter media in place during the treatment of more soil volume than other subsequent filter material Therefore, if the samples are collected early in the project, e g , filters in place during the first 300 yd^3 of soil, all subsequent filters will require change out before an additional 300 yd^3 is processed, or additional sampling will be required

3) If the same type of filters are used in series, the sample will come from the first inline filter of that type

TABLE 3-5 SAMPLE TYPES AND ANALYTICAL METHODS TO MEET ENVIROCARE'S MIXED WASTE WAC

Analytical Method	Analytes	# of Samples	Utah cert. required	Container	Preservative	Holding Time
Gamma Spectrometry	gamma emitting radioisotopes	2	Yes	TBD-enough for 1000 g of sample	None	6 months
Isotopic analysis	Uranium thorium americium, and plutonium isotopes	2	Yes	250 ml wide mouth glass jar	None	6 months
SW 846 Chapter 7	Reactive Sulfide Reactive Cyanide	2	Yes	combine with TCLP jar	Cool 4 C	7 days 14 days
SW 846 Method 9045	Soil pH or corrosivity	2	Yes	combine with TCLP jar	Cool 4 C	ASAP (up to 14 days)
SW 846 Method 8240B/8260A	Volatiles	2	Yes	250 ml wide mouth glass jar with Teflon lined lid	Cool 4 C	14 days
SW 846 Method 8240B/8260A	Volatiles	1 trip blank per cooler	Yes	2 x 40 ml VOA vials Teflon lined septa lids	Cool 4 C HCl to pH<2	14 days
TCLP SW 846 1311 (extraction)	8 TCLP metals + Cu Zn Sb Be Ni Tl V (Method 6010A except Hg, Method 7470) all analysis with detection levels < RCRA UTS Note use Method 7841 for thallium if can t meet UTS levels with Method 6010A TCLP Semivolatiles (Method 8270/8270A) TCLP Chlorinated Herbicides (Method 8150) TCLP Organochlorine Pesticides (Method 8080) TCLP Volatiles (Method 8240A/8260)	2	Yes	1 L wide mouth glass jar with Teflon lined lid as appropriate so that the TCLP can be combined with other samples listed in this table Note will need at least 200 grams of sample for the TCLP alone Therefore more/larger containers may be necessary considering the low density of the filters	Cool 4 C	180 days from extraction 180 days from extraction to analysis except Hg 28 days to extraction 28 days from extraction to analysis 14 days to TCLP extraction, 7 days to preparative extraction 40 days from preparative extraction to analysis 14 days to TCLP extraction 7 days to preparative extraction, 40 days from preparative extraction to analysis 14 days to TCLP extraction, 7 days to preparative extraction 40 days from preparative extraction to analysis 14 days to extraction 14 days from extraction to analysis
SW 846 Method 8270B	Semivolatiles	2	Yes	500-ml wide mouth glass jar with Teflon lined lid	Cool 4 C	14 days to extraction, 40 days from extraction to analysis
Determined by Envirocare	Envirocare evaluation (finger print) samples	≥5	N A	2 pound as required	None	None

3.3 3 PPE Evaluation

PPE generated from this project will be evaluated with respect to potential chemical and radiological contamination

It is anticipated that spent PPE generated during the project will be disposed at the on-site landfill as non-hazardous, non-radioactive solid waste Some decontamination of PPE may be required prior to disposal All spent PPE will be surveyed prior to removal from the contamination reduction zone (CRZ) If radiological contamination is detected above release requirements, or if the PPE appears to be stained and/or heavily soiled, the PPE will be decontaminated so that it no longer contains significant soiling, staining or contamination Decontamination will take place within the CRZ or at the main decontamination facility

To meet the conditions of unrestricted release, the PPE must

- be free of appreciable staining and/or heavy soiling to address chemical concerns,
- meet the requirements for unrestricted release in procedure 4-S23-ROI-03.02, *Radiological Requirements for Unrestricted Release*, and the evaluation criteria specified in procedure 4-Q97-REP-1003, *Radiological Evaluation for Unrestricted Release of Property/Waste*

PPE that cannot meet these requirements will be evaluated on a case by case basis, including the probable disposition (off-site), and the collection of appropriate samples to support disposition. PPE evaluations will be documented in the field logbook.

3 4 SAMPLING BELOW CONTAMINATED SOIL FEED STOCKPILES

After completing the Mound Site soil treatment, residual contamination remaining at the CSFS will be removed and treated such that soil below the stockpiles will have no residual contamination above the VOC cleanup target levels specified in Table 3-1 of the PAM Soils treated as part of this operation will meet the TDU performance goals specified in Table 3-2 of the PAM.

Following removal of soil suspected to be contaminated with residual VOCs, the stockpile (100' x 40') will be divided into eight (8) approximately equal area rectangles of 20' x 25' One grab sample will be collected from the center of each rectangle, approximately 0-2" below the surface, and analyzed for total VOCs

In addition to these samples, the field supervisor and project manager may request the collection of samples from other areas which have a potential for residual VOC contamination from the operations As appropriate, this determination will be documented in the field logbook.

3 5 QC AND RADIOLOGICAL SCREENING SAMPLES

Thıs sectıon states the general approach for QC and radıologıcal screenıng samples for thıs project Addıtıonal detaıls regardıng these samples are gıven ın the tables of the respectıve sectıons of thıs document

3 5 1 QC Samples

QC samples wıll be collected from the excavatıon boundary, and durıng the ınıtıal TDU baselınıng ınvestıgatıon descrıbed ın Sectıons 3 1 and 3 2 1, respectıvely Subsequently, QC samples wıll be collected at the rate of 1 per 20 samples durıng process verıficatıon VOC soıl samplıng (Sectıon 3 2 2)

The followıng types of QC samples are beıng collected to support the Mound Sıte remedıatıon

- Duplıcates Duplıcate (collocated) samples wıll be collected ın the same manner and analyzed by the same analytıcal methods, ın the same laboratory as the regular grab samples descrıbed ın Sectıons 3 1 and 3 2 These samples wıll be submıtted blınd to the laboratory All duplıcate samples wıll be collected usıng the same samplıng equıpment used for collectıon of the regular samples Samplıng equıpment wıll be decontamınated whıle collectıng regular and QC samples from the same locatıon

- Equıpment rınsate blanks These samples wıll be prepared by collectıng dıstılled water, poured over decontamınated samplıng equıpment, between collectıon of regular samples These blanks wıll be submıtted wıth the regular samples These samples wıll be preserved to a pH<2 wıth hydrochlorıc acıd (HCl), and wıll be analyzed for VOCs, as approprıate

- Trıp blanks A trıp blank sample wıll be shıpped wıth the first 10 coolers sent off-sıte contaınıng samples beıng analyzed for VOCs The qualıty engıneer wıll evaluate the blank results Assumıng sıgnıficant contamınatıon ıs not found wıthın the blanks the Qualıty Engıneer may reduce the collectıon of blanks to that of the duplıcates/equıpment rınsate blanks (1 per 20 regular samples) Thıs trıp blank wıll be pre-prepared by the laboratory performıng the analysıs The trıp blank wıll be prepared usıng carbon filtered water and preserved to a pH<2 wıth HCl

All VOC samples sent to a laboratory for analysıs wıll be analyzed according to the U S Envıronmental Protectıon Agency's (EPA) SW846 method 8260A (EPA, 1992)

3 5 2 Radıologıcal Screenıng Samples

Samples beıng sent off-sıte for analyses wıll requıre evaluatıon under the U S Department of Transportatıon's radıoactıve materıals crıterıa of 2000 pCı/g total radıoactıvıty In addıtıon, requırements from the off-sıte laboratory's radıoactıve materıals lıcense wıll be complıed wıth

Radiological field screening performed in support of the excavation activities will be sufficient to support the DOT and off-site laboratory data requirements However, if radiological screening indicates higher than anticipated levels of radioactivity, samples may be required for on-site gross alpha/beta evaluation prior to any off-site sample shipment. This determination will be made by radiological controls personnel At the discretion of the field supervisor, sample analysis using a HPGe gamma spectroscopy system may substitute for gross alpha/beta radiological screens This HPGe analysis is described in Section 3 1 2

4 0 SAMPLE DESIGNATION

Each sample will be assigned a unique nine digit number Table 4-1 lists the sample types, sample number ranges and location code blocks available for the Mound Site Source Removal Project.

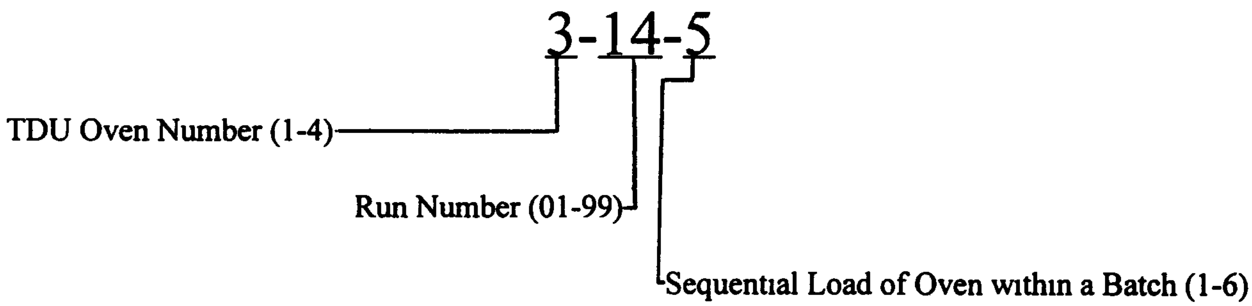
TABLE 4-1 MOUND SITE SAMPLE AND LOCATION CODES

Sample Type	Sample Number Block	Location Code	Notes
EB (Excavation Boundary)	EB00001RM-EB00200RM	Mound Site	
PV (Process Verification)	PV00501RM-PV00800RM	TDU, TDU-1, TDU-2, TDU-3, TDU-4, TDU-5, TDU-6	
Debris (Treatment Residuals)	DB00501RM-DB00800RM	Mound Site, Mound Misc, Mound HEPA, Mound HEAF, Condensate	
ST (Soil Stockpiles)	ST00001RM-ST00100RM	Mound CSFS, Mound Site	Used for CSFS sampling and any incidental spill areas

The first two digits of the sample number represent the sample type The next five digits in the sample number will be sequential numbers representing the individual samples The last two digits of the sample number will represent the company responsible for the sampling

In addition to the location code block stated above, the process verification, and if collected, the pre-treatment samples will have additional location information provided on the logsheets This will help to further define which oven, run, and load number the samples have come from The number sequence will be that the first digit represents the TDU oven number (1-4), which will be followed by a dash The next two digits represent the run number (01-99), followed by a dash The last digit will represent the sequential load of the run This number will range from 1-6 because six loads will make up a run, and the run combined with the oven will make up a batch Figure 4-1 graphically represents this scheme

FIGURE 4-1 GRAPHICAL REPRESENTATION OF THE PROCESS VERIFICATION SAMPLE LOCATION IDENTIFICATION SCHEME



Taken together, can be considered a batch (e g , 3-14)

5 0 SAMPLING SUPPORT INFORMATION

This chapter describes the sample handling, documentation, and quality assurance requirements necessary to support the successful completion of this project

5 1 SAMPLE HANDLING PROCEDURES

Samples collected for laboratory analysis will follow *Environmental Management Department (EMD) Operating Procedures Volume I Field Operations 5-21000-OPS-FO 13 Containerization Preserving, Handling and Shipping of Soil and Water Samples* All water samples will be collected without the use of filters When reusable sampling equipment is used, the equipment will be decontaminated in accordance with EMD Operating Procedure 5-21000-OPS-FO 03, *General Equipment Decontamination Section 5 3 Cleaning Procedures for Stainless Steel or Metal Sampling Equipment*

5 2 DOCUMENTATION

Field data shall be documented on the forms developed for this project, and in accordance with the referenced procedure The originator shall authenticate (legibly sign and date) each completed hardcopy of the data A peer reviewer, someone other than the originator, shall perform a peer review on each hardcopy of data The peer reviewer shall authenticate (legibly sign and date) each hardcopy completed by the originator Any modifications shall be lined-through, initialed, and dated by the reviewer (in ink) Data planned for computerized reduction and analysis shall be entered into electronic form in accordance with the procedure, 4-B29-ER-OPS-FO 14, *Field Data Management*

5.3 QUALITY ASSURANCE

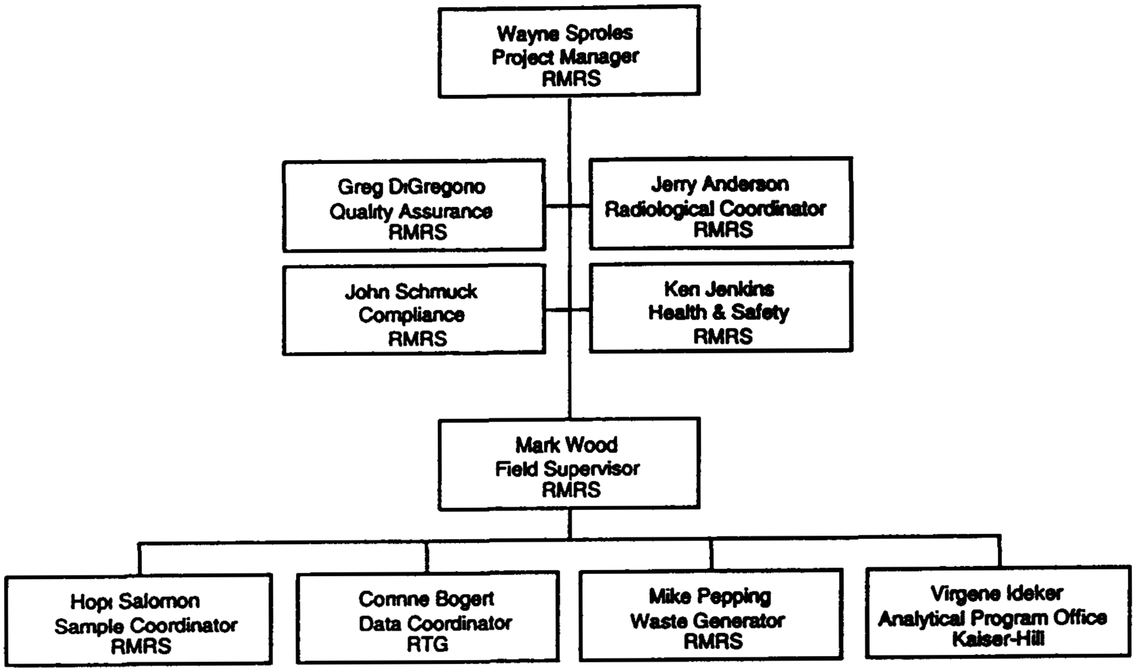
Analytical data collected in support of the Mound Site remediation will be evaluated using the guidance established by the Rocky Flats Administrative Procedure 2-G32-ER-ADM-08 02, *Evaluation of ERM Data for Usability in Final Reports* This procedure establishes the guidelines for evaluating analytical data with respect to precision, accuracy, representativeness, completeness, and comparability (PARCC) parameters Since the Mound Site cleanup project is committing large personnel and equipment resources, field decisions, will be based on "Form-1's" faxed directly from the laboratory This will allow for the timely use of analytical results Data validation will be performed according to the Rocky Flats Analytical Projects Office (APO), Analytical Services Performance Assurance Group procedures, but will be done after the data is used for its intended purpose Analytical laboratories supporting this task have all passed regular laboratory audits by the Rocky Flats APO

6 0 PROJECT ORGANIZATION

Figure 6-1 represents the organization structure for this project. The Project Manager is responsible for ensuring that all data are collected, verified, transmitted and stored in a manner consistent with relevant operating procedures The Project Manager, or designee, will obtain from the RFEDS, sample numbers and location codes

The sample crew personnel will be responsible for field data collection Data management tasks will include completing all appropriate data management forms and completing the chain-of-custody form The sample crew will coordinate sample shipment with APO personnel The Sample Manager is responsible for verifying that the chains-of-custody are complete and accurate before the samples are shipped to the laboratory

FIGURE 6-1 MOUND SITE SOURCE REMOVAL ORGANIZATIONAL STRUCTURE



7 0 REFERENCES

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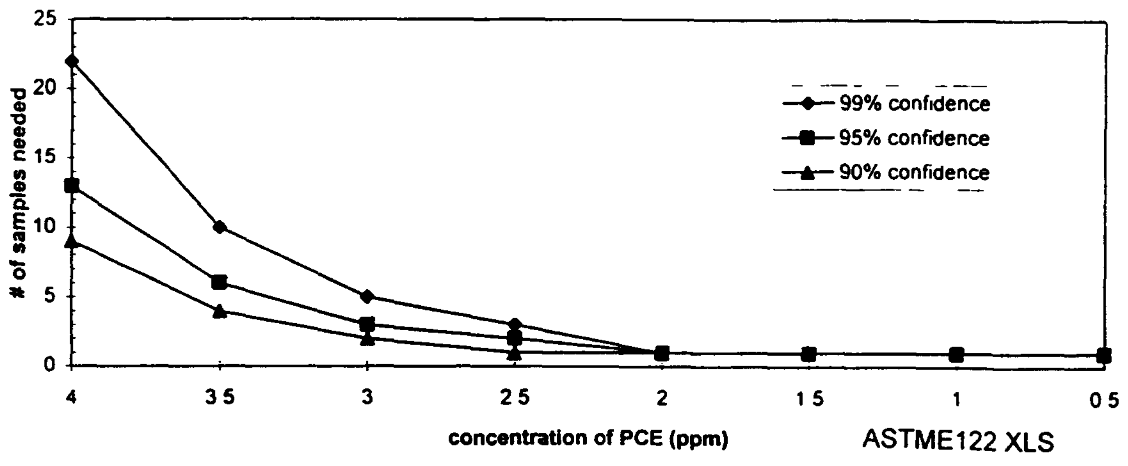
Appendix 1
Optimizing the Number of VOC Samples Collected from Baseline Processing

Given adequate process control the number of samples required to be collected through the thermal desorption remediation process is a function of the performance of the TDU The lower the mean value of VOC concentrations in the treated soils (as established during the initial baselining process), the fewer samples required after the baseline has been established PCE is expected to be the "limiting contaminant" That is, of all the VOCs present in the Mound Site soils, the performance goal for PCE (6 mg/kg) is expected to be the most difficult to achieve This is because PCE not only is present in the Mound Site soils at higher concentrations relative to other VOCs, it also has the highest boiling point/lowest vapor pressure of the VOCs present (e g , boiling points of PCE, TCE, carbon tetrachloride, and methylene chloride are 121°C, 87°C, 77°C, 40°C, respectively)

The type curve used for establishing the number of samples is given in Figure A1-1 As the figure indicates, if the mean VOC concentration of concern (e g , PCE) is 3 mg/kg, then 3 samples will be required per batch for a 95% confidence If the mean concentration is 2 mg/kg then one sample will be required per batch Assuming, that baseline sampling will establish a mean PCE concentration of 2 mg/kg or less, one sample would be collected per batch after baseline conditions have been established

Figure A1-1 Type Curve for the Number of After-Process Verification VOC Samples Required After Baseline Conditions Have Been Established



[1]ASTM E 122 72 1979 Standard Recommended Practice for Choice of Sample Size to Estimate the Average Quality of a Lot or Process

Figure A1-1 was derived by using equations from ASTM (1979[1]) A standard deviation of 67% of the mean VOC concentration was assumed (consistent with a normal distribution of data), while the maximum error allowable was set to insure that the average concentrations of limiting VOCs would not exceed regulatory thresholds (in the Mound Site case 6 mg/kg for the limiting VOC PCE) Calculations were performed at several potential concentrations and at several confidence levels, as depicted by the data points on the type-curves A confidence of 95% or better will be achieved by using these curves to select the number of samples from a ' batch of soil